



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------|------------------|
| 10/511,408 | 04/08/2005 | John Mak | 100325.0198US | 9198 |
| 34284 | 7590 | 12/11/2007 | EXAMINER | |
| Rutan & Tucker, LLP. Hani Z. Sayed 611 ANTON BLVD SUITE 1400 COSTA MESA, CA 92626 | | | WU, IVES J | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 1797 | |
| | | | MAIL DATE | DELIVERY MODE |
| | | | 12/11/2007 | PAPER |

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/511,408

Applicant(s)

MAK, JOHN

Examiner

Ives Wu

Art Unit

1797

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 April 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 and 12-16 is/are rejected.
- 7) ☒ Claim(s) 11 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application
- ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

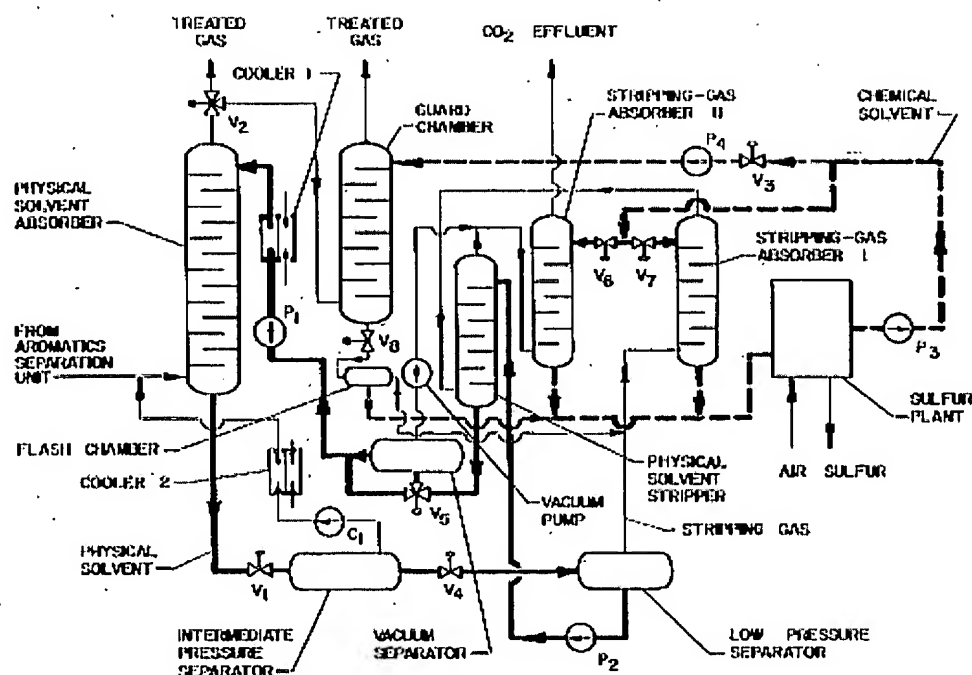
(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

(1). **Claims 1, 6-10, 12, 15-16** are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller et al (US04080424) website: www.environmental-expert.com and Cabbage (US03301778).

As to at least one of a high-pressure flash vessel and a medium pressure flash vessel coupled to the vacuum stripper, wherein at least one of the high-pressure flash vessel and the medium pressure flash vessel to provide a substantially hydrogen sulfide-free stripping gas to the vacuum stripper in a plant in **independent claim 1**, Miller et al (US04080424) disclose process for acid gas removal from gaseous mixture (Title) as shown in the following:



Intermediate pressure separator and low pressure separator which is coupled to the physical solvent stripper through stripping gas absorber 1 and provides stripping gas as illustrated in the Figure above. The intermediate pressure separator liquid output containing the physically absorbed CO₂ and H₂S is then passed through valve V₄ to a low pressure separator reducing the pressure to approximately atmospheric to produce stripping gas for use in stripping gas absorber 1. **The low pressure separator vapor output contains nearly all of the CO₂ and most of the H₂S physically absorbed by the physical solvent.** Stripping gas absorber 1 removes H₂S from the CO₂ stripping gas by use of an H₂S selective chemical solvent (Col. 5, line 17-27).

As to a vacuum stripper that is configured to produce an ultra-clean physical solvent from a lean hydrogen sulfide-containing physical solvent in a plant in **independent claim 1**, Miller et al (US04080424) disclose physical solvent stripper as shown in the Figure above. A portion of liquid output of the physical solvent stripper controlled by valve V₅ may be passed through the vacuum separator reducing the pressure the pressure about 3 to 10 psia, below atmospheric pressure, by use of a vacuum pump, thereby further reducing the CO₂ content of the physical solvent stream to about 1 mol% and recycle to the physical solvent absorber. The high efficiency

of the process is dependent upon the physical solvent absorber feed containing very low amounts of H_2S and CO_2 , preferably less than 5 ppm sulfur and less than 0.5 mol% of CO_2 (Col. 5, line 32-48). Miller et al do not teach the physical solvent stripper to be a vacuum stripper as claimed.

However, it is well known in the art that Mass Transfer volatile compounds from liquid to the vapor phase to be significantly increased under conditions of lower absolute pressure – website: www.environmental-expert.com/STSE_resultteach_product. Also it is taught by Cabbage (US03301778) that a normal state for vacuum stripper is not to use external heat (Col. 3, line 37-38).

Therefore, it would have been obvious at time of the invention to replace the physical solvent stripper to be a vacuum striper in the process of Miller et al in order to obtain the above-cited advantage.

As to lean hydrogen sulfide-containing physical solvent comprising at least 100 ppm hydrogen sulfide, ultra-lean physical solvent comprising less than 100 ppm hydrogen sulfide in **claim 6**, ultra-lean physical solvent comprising less than 10 ppm in **claim 7**, Miller et al (US04080424) disclose the hydrogen sulfide content to be 100 in Table I, and treated gas output has H_2S concentration is 1 ppm (Col. 8, line 10-13).

As to hydrogen sulfide-containing physical solvent selection in **claim 8**, Miller et al (US04080424) disclose specific chemicals which are especially useful as physical solvents include propylene carbonate, dimethyl ether of polyethylene glycol; n-methyl-2 pyrrolidone (Col. 4, line 16-29).

As to substantially hydrogen sulfide-free stripping gas comprising at least 95 mol% carbon dioxide in **claim 9**, Miller et al (US04080424) disclose the gaseous output from the stripping gas absorber 1, mainly CO_2 free of H_2S , to be used as stripping gas to remove the H_2S from low pressure separator liquid output which is passed in countercurrent flow relationship in the physical solvent stripper (Col. 5, line 28-32).

As to separator in which acid gas to be separated from a rich solvent, thereby producing the lean hydrogen sulfide-containing physical solvent, and wherein part of acid gas being compressed and injected into a formation in **claim 10**, Miller et al (US04080424) disclose the

intermediate pressure separator releasing absorbed hydrocarbons which are recompressed and returned to the physical solvent absorber. It is desirable to cool by cooler 2 (Col. 5, line 6-16).

As to step of separating in at least one of a high-pressure flash vessel and a medium pressure flash vessel a substantially hydrogen sulfide-free stripping gas from a physical solvent in a method of producing an ultra-clean physical solvent in **independent claim 12**, Miller et al (US04080424) disclose intermediate pressure separator and low pressure separator to produce liquid output and stripping gas containing nearly all of the CO₂ and most of the H₂S physically absorbed by the physical solvent (Col. 5, line 6-27).

As to step of stripping hydrogen sulfide from a lean hydrogen sulfide-containing physical solvent in a vacuum stripper to form the ultra-lean physical solvent in a method of producing an ultra-clean physical solvent in **independent claim 12**, the disclosure of Miller et al and website: www.environmental-expert.com is incorporated herein by reference, the most subject matters as currently claimed, have been recited in applicant's claim 1 and have been discussed therein.

As to lean hydrogen sulfide-containing physical solvent selection in **claim 15**, Miller et al (US04080424) disclose specific chemicals which are especially useful as physical solvents include propylene carbonate, dimethyl ether of polyethylene glycol; n-methyl-2 pyrrolidone (Col. 4, line 16-29).

As to substantially hydrogen sulfide-free stripping gas comprising at least 95 mol% carbon dioxide in **claim 16**, Miller et al (US04080424) disclose the gaseous output from the stripping gas absorber 1, mainly CO₂ free of H₂S, to be used as stripping gas to remove the H₂S from low pressure separator liquid output which is passed in countercurrent flow relationship in the physical solvent stripper (Col. 5, line 28-32).

(2). **Claims 2- 5, 13-14** are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller et al (US04080424) in view of website: www.environmental-expert.com, further in view of Mak et al (US07192468).

As to absorber to receive ultra-lean physical solvent and to be configured to operate with an isothermal gradient or with a decreasing top-to-bottom thermal gradient in **claim 2**, Miller et

al (US04080424) disclose the physical solvent absorber as shown in Figure above. To minimize the rate of physical solvent circulation, it is desirable to introduce the regenerated physical solvent into the top of the physical solvent absorber at as low a temperature as practical (Col. 4, line 38-41). When the gas is the product of coal gasification the pressure in the physical solvent absorber **may be** at about 800 to 1200 psia and the temperature of the gaseous stream input to the physical solvent absorber at about 60 to 120° F. Any configuration of gas-liquid contact chamber is suitable, desirably one exhibiting a low pressure drop and high volume flow through such chamber (Col. 3, line 54-55). Miller et al **do not teach** the absorber to be configured to operate with an isothermal gradient or with a decreasing top-to-bottom thermal gradient as claimed.

However, Mak et al (US07192468B2) **teach** the configurations and method for improved gas removal (Title). Cool and dehydrate feed gas (Col. 2, line 41-47). Furthermore, operation of the absorber bottom at a lower temperature will allow operation of the absorber at a reduced solvent circulation (Col. 6, line 58-60).

The advantage of to have lower temperature at bottom of the absorber is to reduce the solvent circulation, thus increasing efficiency (Col. 6, line 58-60).

Therefore, it would have been obvious at time of the invention to configure the absorber with decreasing temperature gradient disclosed by Mak for the absorber of Miller et al in order to attain the above-cited advantage.

As to feed gas comprising at least 10 mol% carbon dioxide and at least 500 ppm hydrogen sulfide in **claim 3**, Miller et al (US04080424) disclose the gas input of 15 to 40 mol% CO₂ wherein the CO₂ over the H₂S is 25 to 50 to a product stream (Col. 2, line 51-54).

As to feed gas at pressure at least 1000 psig in **claim 4**, Miller et al (US04080424) disclose the gas input at pressure of 800 to 1200 psia (Col. 3, line 53).

As to feed gas being partially dehydrated, and further cooled by a rich solvent in **claim 5**, the material worked upon does not affect patentability. The intended use is not considered as limitation for apparatus claim.

As to step of feeding the ultra-clean physical solvent to an absorber in **claim 13**, Miller et al (US04080424) disclose gas input from aromatic separation unit to the physical solvent absorber as shown in Figure above.

As to step of operating the absorber with an isothermal gradient or with a decreasing top-to-bottom thermal gradient in **claim 13**, the disclosure of Miller et al, Mak et al is incorporated herein by reference, the most subject matters as currently claimed, has been recited in applicant's claim 2, and has been discussed therein.

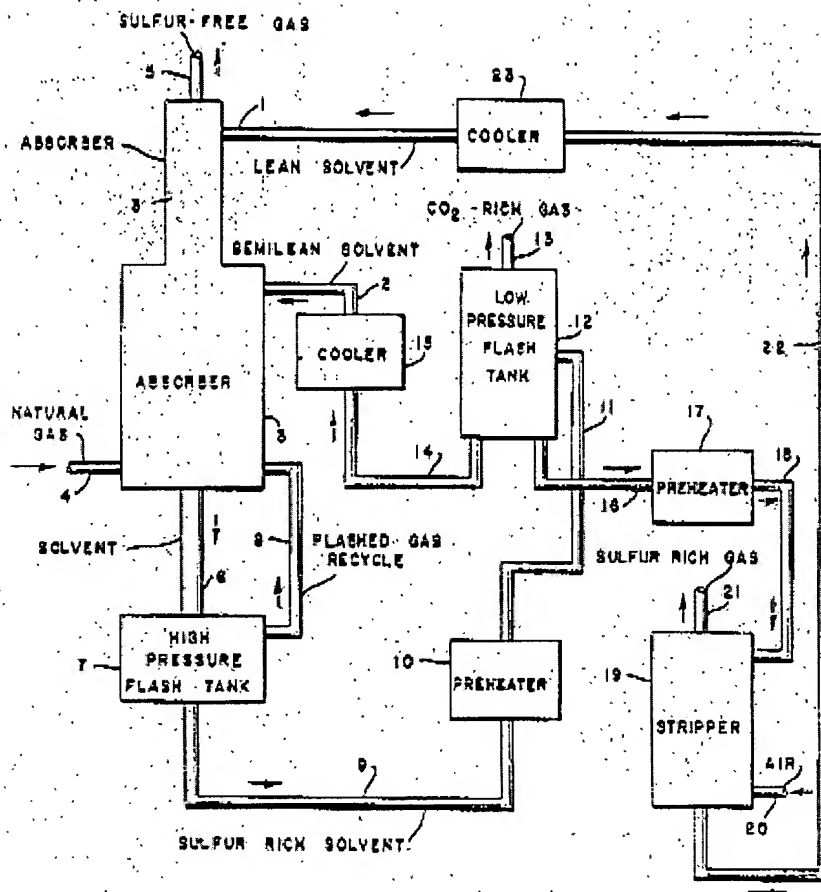
As to step of feeding gas to the absorber at a pressure of at least 1000 psig, wherein the feed gas comprising at least 10 mol% carbon dioxide and at least 500 ppm hydrogen sulfide in **claim 14**, the disclosure of Miller et al, Mak et al is incorporated herein by reference, the most subject matters as currently claimed, has been recited in applicant's claims 3 and 4, and has been discussed therein.

ALTERNATIVELY, CLAIMS 1-16 ARE REJECTED IN THE FOLLOWING:

(3). **Claims 1- 10, 12-16** are rejected under 35 U.S.C. 103(a) as being unpatentable over Ameen et al (US03594985) Gravis, III et al (US03841382).

As to a vacuum stripper that is configured to produce an ultra-clean physical solvent from a lean hydrogen sulfide-containing physical solvent in a plant in **independent claim 1**, Ameen et al (US03594985) disclose stripping reducing the hydrogen sulfide concentration in the solvent to a few parts per million (Col. 4, line 66-68).

As to at least one of a high-pressure flash vessel and a medium pressure flash vessel coupled to the vacuum stripper, wherein at least one of the high-pressure flash vessel and the medium pressure flash vessel to provide a substantially hydrogen sulfide-free stripping gas to the vacuum stripper in a plant in **independent claim 1**, Ameen et al (US03594985) disclose acid gas removal from gas mixtures (Title). As shown in the following Figure, which includes high-pressure flash tank 7, low pressure flash tank 12, stripper 19, which illustrates the features as claimed:



An improved solvent and process for treating and separating acid gas, particularly hydrogen sulfide from gas mixture containing the same, such as natural gas mixtures containing hydrogen sulfide, carbon dioxide and methane. Stripper 19 can be operated either at atmosphere or lower pressure (Col. 4, line 62-63). Ameen et al disclose the effluent gas CO₂ - rich gas from low pressure flash tank 13. A flow of heated air is passed through line 20 into the stripper to aid desorption of hydrogen sulfide (Col. 4, line 64-65). Ameen et al **do not teach** the stripping gas to be substantially hydrogen sulfide free stripping gas from flash tank as claimed.

However, Gravis, III et al (US03841382) **teach** glycol regenerator using controller gas stripping under vacuum (Title). Although the dry air can be used as a stripping gas it may be desirable to use flue gas which comprises mainly carbon dioxide and use this as stripping gas (Col.3, line 33-37).

The advantage of using flue gas comprising mainly carbon dioxide is more acceptable from a safety standpoint (Col. 3, line 33-37).

Therefore, it would have been obvious at time of the invention to substitute the CO₂ rich gas from low pressure flash tank of Ameen et al for the preheated air (stripping gas) of stripper of Ameen et al based on their interchangeability as recognized functional equivalence as stripping gas in the vacuum stripper, furthermore to attain the above-cited advantage.

As to absorber to receive ultra-lean physical solvent and to be configured to operate with an isothermal gradient or with a decreasing top-to-bottom thermal gradient in **claim 2**, Ameen et al (US03594985) disclose the absorber 3 receiving the lean solvent from line 22 as shown in the Figure above. Temperature of absorption zone is preferably maintained at about 30° to 120° F (Col. 3, line 60-61).

As to feed gas comprising at least 10 mol% carbon dioxide and at least 500 ppm hydrogen sulfide in **claim 3**, feed gas having a pressure of at least 1000 psig in **claim 4**, feed gas at least partially dehydrated in **claim 5**, the material worked upon does not affect patentability. The intended use is not considered as limitation for apparatus claim.

As to lean hydrogen sulfide-containing physical solvent comprising at least 100 ppm hydrogen sulfide, ultra-lean physical solvent comprising less than 100 ppm hydrogen sulfide in **claim 6**, ultra-lean physical solvent comprising less than 10 ppm in **claim 7**, Ameen et al (US03594985) disclose natural gas containing 128 ppm of hydrogen sulfide in Example III (Col. 6, line 45). Practically all of the hydrogen sulfide and the bulk of the carbon dioxide remain in the effluent solvent which passes from the high-pressure flash tank 7 to low pressure flash tank (Col. 44-49). Therefore the lean solvent still contains 128 ppm of hydrogen sulfide. Stripping reduces the hydrogen sulfide concentration in the solvent to a few parts per million (Col. 4, line 66-68).

As to hydrogen sulfide-containing physical solvent selection in **claim 8**, Ameen et al (US03594985) disclose solvent comprising a mixture of dimethyl ethers of polyethylene glycols (Abstract, line 5-6).

As to substantially hydrogen sulfide-free stripping gas comprising at least 95 mol% carbon dioxide in **claim 9**, Ameen et al (US03594985) disclose CO₂ – rich gas 13 shown in the Figure above, which would reads on the limitation of instant claim.

As to separator in which acid gas to be separated from a rich solvent, thereby producing the lean hydrogen sulfide-containing physical solvent, and wherein part of acid gas being compressed and injected into a formation in **claim 10**, Ameen et al (US03594985) disclose the gas from flash tank 7, containing methane and carbon dioxide to be pumped through line 8 to the absorber (Col. 4, line 42-44).

As to step of separating in at least one of a high-pressure flash vessel and a medium pressure flash vessel a substantially hydrogen sulfide-free stripping gas from a physical, step of stripping hydrogen sulfide from a lean hydrogen sulfide-containing physical solvent in a vacuum stripper to form the ultra-lean physical solvent in a method of producing an ultra-clean physical solvent in **independent claim 12**, the disclosure of Ameen et al, Gravis, III et al is incorporated herein by reference, the most subject matters as currently claimed, have been recited in applicant's claim 1 and have been discussed therein.

As to step of operating the absorber with an isothermal gradient or with a decreasing top-to-bottom thermal gradient in **claim 13**, the disclosure of Ameen et al is incorporated herein by reference, the most subject matters as currently claimed, has been recited in applicant's claim 2, and has been discussed therein.

As to step of feeding gas to the absorber at a pressure of at least 1000 psig, wherein the feed gas comprising at least 10 mol% carbon dioxide and at least 500 ppm hydrogen sulfide in **claim 14**, the material worked upon does not affect patentability. The intended use is not considered as limitation for apparatus claim.

As to lean hydrogen sulfide-containing physical solvent selection in **claim 15**, and substantially hydrogen sulfide-free stripping gas comprising at least 95 mol% carbon dioxide in **claim 16**, the disclosure of Ameen et al is incorporated herein by reference, the most subject matters as currently claimed, has been recited in applicant's claims 8 and 9, and has been discussed therein.

Application/Control Number:
10/511,408
Art Unit: 1797

Page 11

Allowable Subject Matter

(4). **Claim 11** is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ives Wu whose telephone number is 571-272-4245. The examiner can normally be reached on 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Duane Smith can be reached on 571-272-1166. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

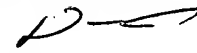
Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Examiner: Ives Wu

Art Unit: 1797

Date: December 1, 2007

DUANE SMITH
PRIMARY EXAMINER


12-7-07